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TI Electrolysed water generator - has electrolytic cell with partition made  
of hydrogen ion conductive diaphragm for anode and cathode chambers to  
apply direct current  
DC D15  
IN GYOTEN H; INATANI M  
PA (MATU-C) MATSUSHITA DENKI SANGYO KK; (MATJ-C) MATSUSHITA REIKI KK  
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4D061/EB35; 4D061/ED12; 4D061/ED13  
AB JP 09299953 A UPAB: 20050520  
Electrolysed water generator has an electrolytic cell with a partition made of a hydrogen  
ion conductive diaphragm for anode and cathode chambers to apply direct current to  
respective electrodes.  
ADVANTAGE - Electrolysed water close to neutral pH with a strong sterilising and cleaning  
power is obtained.  
MC CPI: D04-A01P

## ELECTROLYTIC WATER GENERATOR

**Publication number:** JP9299953 (A)

**Publication date:** 1997-11-25

**Inventor(s):** INATANI MASATOSHI; GYOTEN HISAAKI

**Applicant(s):** MATSUSHITA REFRIGERATION; MATSUSHITA ELECTRIC IND CO LTD

**Classification:**

- **International:** C02F1/46; C02F1/46; (IPC1-7): C02F1/46

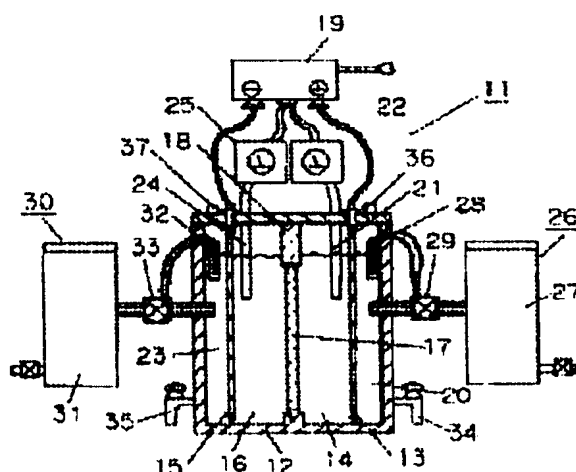
- **European:**

**Application number:** JP19960118717 19960514

**Priority number(s):** JP19960118717 19960514

### Abstract of JP 9299953 (A)

**PROBLEM TO BE SOLVED:** To generate an electrolytic water having an oxidation/reduction property close to neutral by providing an electrolytic cell having a partition wall furnished with a hydrogen ion-conductive membrane partitioning a cathode compartment and an anode compartment, filling the cell with an electrolyte and impressing a DC voltage between the cathode and anode. **SOLUTION:** An electrolytic cell 12 is divided by a partition wall 18 formed with a hydrogen ion-conductive membrane 17 into an anode compartment 14 having an anode 13 and a cathode compartment 16 having a cathode 15. Both electrodes 13 and 15 are connected to a DC power source, and gaseous chlorine and gaseous oxygen are generated from the surface of the anode 13 as a current is applied to form hypochlorous acid and hypochlorite ion in electrolytic water 20. However, the chlorine ion is not increased, an excess of hydrogen ion is transferred to the cathode compartment 16 through the membrane 17, and the generation of strongly acidic water is suppressed. Meanwhile, since gaseous hydrogen is generated on the cathode 15 surface and hydroxyl ion is formed in an electrolyte 23, the change to alkali is retarded.



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(71)Applicant : **MATSUSHITA REFRIG CO LTD  
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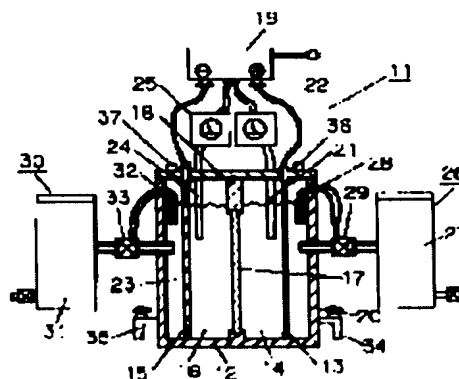
## (54) ELECTROLYTIC WATER GENERATOR

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To generate an electrolytic water having an oxidationreduction property close to neutral by providing an electrolytic cell having a partition wall furnished with a hydrogen ion-conductive membrane partitioning a cathode compartment and an anode compartment, filling the cell with an electrolyte and impressing a DC voltage between the cathode and anode.

**SOLUTION:** An electrolytic cell 12 is divided by a partition wall 18 formed with a hydrogen ion-conductive membrane 17 into an anode compartment 14 having an anode 13 and a cathode compartment 16 having a cathode 15. Both electrodes 13 and 15 are connected to a DC power source, and gaseous chlorine and gaseous oxygen are generated from the surface of the anode 13 as a current is applied to form hypochlorous acid and hypochlorite ion in electrolytic water 20. However, the chlorine ion is not increased, an excess of hydrogen ion is transferred to the cathode compartment 16 through the membrane 17, and the generation of strongly acidic water is suppressed.

Meanwhile, since gaseous hydrogen is generated on the cathode 15 surface and hydroxyl ion is formed in an electrolyte 23, the change to alkali is retarded.



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技術表示箇所

A

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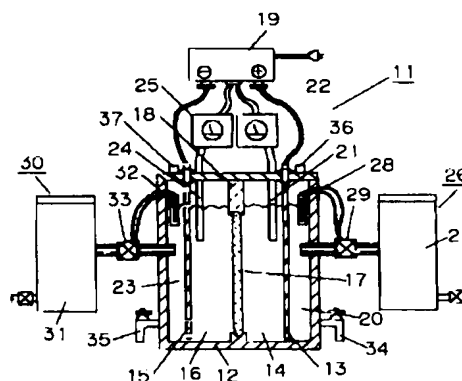
(54) 【発明の名称】 電解水生成装置

(57) 【要約】

【課題】 人体への安全性、廃棄時の環境汚染を考慮し、中性に近い酸化・還元性を有する殺菌および洗浄力の強い電解水を生成する。

【解決手段】 陰極15を持つカソード室16と、陽極13を持つアノード室14と、カソード室16とアノード室14とを仕切る隔壁18を水素イオン伝導型膜17で構成したことを特徴とする電解槽12で、電解槽12に電解液又は浄水、イオン交換水、蒸留水、純水を満たし、陰極15と陽極13に直流電圧を付加し電解水进行处理する。

11 電解水生成装置  
12 電解槽  
13 陽極  
14 アノード室  
15 陰極  
16 カソード室  
17 水素イオン伝導型膜  
18 隔壁  
26, 30 注入機構  
34, 35 排水機構



## 【特許請求の範囲】

【請求項1】 陰極を持つカソード室と、陽極を持つアノード室と、前記カソード室とアノード室とを仕切る水素イオン伝導型膜で構成した隔壁とを有する電解槽で、前記電解槽に電解液を満たし前記陰極と陽極に直流電圧を付加する電解水生成装置。

【請求項2】 陰極を持つカソード室を電解液で満たし、陽極を持つアノード室は浄水又はイオン交換水又は蒸溜水又は純水で満たし、陽極は貫通穴を有するメッシュ状に形成し隔壁の水素イオン伝導型膜に密着させてなる電解槽を特徴とする請求項1記載の電解水生成装置。

【請求項3】 カソード室及びアノード室を浄水又はイオン交換水又は蒸溜水又は純水で満たし、陰極と陽極は貫通穴を有するメッシュ状に形成し隔壁の水素イオン伝導型膜に密着させてなる電解槽を特徴とする請求項1記載の電解水生成装置。

【請求項4】 電解液で満たされ、陽極が浸漬してなるアノード室と、貫通穴を有するメッシュ状に形成した陰極との間に水素イオン伝導型膜を介在させ、前記陰極は前記水素イオン伝導型膜に密着し、前記陰極表面に酸素を含むガスを順次送り込む吸排気機構とを設けた電解槽で、前記陰極と陽極に直流電圧を付加する電解水生成装置。

【請求項5】 電解液を食塩、クエン酸、ほう酸、酢酸等の導電性食品添加物の水溶液とした請求項1又は請求項2又は請求項4記載の電解水生成装置。

【請求項6】 浄水又はイオン交換水又は蒸溜水又は純水で満たされたアノード室に浸漬する陽極と陰極との間に水素イオン伝導型膜を介在させ、前記陽極と陰極は貫通穴を有するメッシュ状に形成され、前記水素イオン伝導型膜に密着してなり、前記陰極表面に酸素を含むガスを順次送り込む吸排気機構とを設けた電解槽で、前記陰極と陽極に直流電圧を付加する電解水生成装置。

【請求項7】 電解槽のカソード室及び／又はアノード室に、電解液又は浄水又はイオン交換水又は純水を順次送り込む注入機構と、順次排出する排水機構とを設けた請求項1から請求項6に記載の電解水生成装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、各種汚染物質の殺菌洗浄や工業材料の表面処理等を目的に、水を電気分解して製造される殺菌洗浄用処理液の製造装置に関する。

## 【0002】

【従来の技術】食塩水を隔膜にて区画したアノード室およびカソード室を有する電解槽にて電気分解すると、特開平6-237747号公報に例示されているように、アノード室からは酸性の生成水が得られるとともに、カソード室側からはアルカリ性の生成水が得られる。このようにして得られた生成水は酸化・還元能が高く、この水の酸化・還元能が医療器具や厨房機器の洗浄や工業材

料の表面処理、微生物の消毒殺菌、植物などの成長に影響を与えていることは知られている。

【0003】洗浄や表面処理の対象となる汚染物質は医療器具ではたんぱく質や体液等の脂質があり、厨房では生鮮食品の土壌菌や、水垢等のぬめりや魚介類等の洗浄液、さらには油汚れがある。工業材料としては半導体表面のイオン状物質や反応生成物、液状、粒子状物質の汚れが主体となる。

【0004】酸性のアノード室側生成水は殺菌作用を融資、また、アルカリ性のカソード室側生成水は魚介類に対する色合いの悪変防止作用およびドリップの発生防止作用、野菜類の色合いの悪変防止作用を有する。このため、これらの各生成水は生鮮植物用の蘇生液等の処理液としてそれぞれ単独で使用される。

【0005】イオン状物質の汚染形態にはガラス表面等に見られるイオン交換による吸着、半導体や金属の表面に見られるイオンの静電的引力による付着、及び半導体、金属、セラミックスの表面層へのイオンの拡散による侵入と言ったものが挙げられる。このようなイオン状物質は薬剤洗浄した後、仕上げとして純水又は超純水によって洗浄されるのが一般的である。例えば半導体の洗浄に際しては、電気抵抗率が約 $18\text{M}\Omega/\text{cm}$ の超純水が用いられる。そして、シリコンウエハ等に付着する液体、又は被膜状の汚染物質の除去には、この汚染物質を酸化解したり、溶解させると言った方法が適用されており、酸化解に用いられる薬剤としては、硫酸と過酸化水素とを組み合わせたもの、水酸化アンモニウムと過酸化水素とを組み合わせたもの等、過酸化水素の酸化力を利用されている。

【0006】これらの酸化力を付加する洗浄液の製法に食塩水を電気分解して製造した電解水の利用も考えられるが、従来の隔膜電解において電気分解を円滑に行うためには食塩等の電解質を数%添加することが不可欠となっていた。この為、得られた電解水中には電解質イオンがかなり含まれることになり、例えば洗浄に利用しようとすると、電解質イオンが残留し、被洗浄物の表面に付着残留する。そして、この残留イオンによる種類の問題が起きる。例えば金属材料の腐食や劣化、生鮮食品の変色、さらに食塩等の塩化物を電解質に利用した場合には塩素臭などの異臭の問題が起る。

【0007】上記問題点を解決する方法として図6で示す特開平7-75784号公報の様にカチオン型イオン交換膜1とアニオン型イオン交換膜2で仕切られた食塩水等の電解液3が介在する中間室4を挟み、陰極5をもつカソード室6と陽極7をもつアノード室8とで構成した電解槽9で、前記カチオン型イオン交換膜1に陽極7を、アニオン型イオン交換膜2に陰極5を密接してなるもので、両電極に直流電源10で直流電圧を印可させ電解処理を行うというものが考案されている。

【0008】図6を元に上記公報の電解処理装置の動作

を説明する。カソード室6とアノード室8とに注入する水溶液としては純水製造装置（図示せず）を使ってそそぎ込まれる純水であり、中間室4には電解液3として食塩水が介在している。陽極7と陰極5とに直流電圧をかけ電気分解を行うと、中間室4の電解液3の食塩水中のカチオンであるナトリウムイオンは陰極5側にアニオンである塩素イオンは陽極7側に引き寄せられる。しかし陽極7側にはカチオン型イオン交換膜1が介在するため塩素イオンの移動は遮断され、アノード室8の水分解により生じた水素イオンがアノード室8側から中間室4側に移動する。また、陰極2側にはアニオン型イオン交換膜2が介在するためナトリウムイオンの移動は遮断され、カソード室6側から中間室4に水酸基イオンが移動することとなる。すなわち、中間室4では水素イオンと水酸基イオンの反応で水が生成し食塩水は生成した水により薄められる。このような水素イオン及び水酸基イオンの移動が生じることにより陰極5と陽極7との間に電流が流れ、陽極7から酸素ガスが、陰極5から水素ガスが発生することとなり水の電気分解がおこなわれる。

【0009】この陽極7表面での酸素生成反応において、酸素ラジカル、過酸化水素、オゾン等の酸化性物質が中間生成物として生じることとなり、酸菌洗浄効果のある電解水の生成が可能になるというものである。

【0010】

【発明が解決しようとする課題】しかしながら、上記のように食塩水を電解液として用い、カチオン型またはアニオン型のイオン交換膜を介して電気分解する方法であれば、直流電圧を付加しない場合には濃度差による浸透圧の影響により、アノード室側にはナトリウムイオン等のカチオンイオンが流入し、またカソード側には塩素イオン等のアニオンイオンが流入することとなり、カソード室やアノード室に満たされた純水の性能レベルを低下させる。

【0011】また、電気分解動作中においてもカチオン型イオン交換膜の分離能は100%完璧なものではなく、現行の市場品の実力は90～95%程度のものであり、陰極側には数%のカチオンであるナトリウムイオンがアニオン型イオン交換膜を通して侵入し、また陽極をもつアノード室側には数%のアニオンイオンである塩素イオンが侵入してします。

【0012】このようにして侵入した塩素イオンにより、カソード室は強酸性を示すことになり、またこの塩素イオンは陽極で電子を奪われると塩素ガスとして変化する。さらに塩素ガスは水に溶解し殺菌効果を示す次亜塩素酸として変化するが、塩素臭としての悪臭を発生すると共に、ナトリウムイオンと塩を形成し被処理物の残留物として腐食や電子部品等への悪影響を及ぼすことになる。

【0013】また、強酸性水や強アルカリ性水は多少の

殺菌効果は認められるものの、反面人体への刺激や浸透性による細胞膜の破壊を引き起こす原因となるもので、長期間使用していると人体に損傷を与えかねないため、取扱いに注意を要する。

【0014】さらに、酸性水やアルカリ性水は公害問題の一因となり、排水においては中和工程が必要となるなど、排水処理の手間がかかる課題も有していた。

【0015】

【課題を解決するための手段】本発明は、陰極を持つカソード室と、陽極を持つアノード室と、前記カソード室とアノード室とを仕切る隔壁を水素イオン伝導型膜で構成したことを特徴とする電解槽で、前記電解槽に電解液または浄水、イオン交換水、蒸溜水、純粋を満たし、前記陰極と陽極に直流電圧を付加することによって電解液を処理する電解水生成装置で、中性に近い酸化・還元性を有する電解水を生成する特徴を持つものである。

【0016】

【発明の実施の形態】この発明の請求項1に記載の発明は、陰極を持つカソード室と、陽極を持つアノード室と、前記カソード室とアノード室とを仕切る水素イオン伝導型膜で構成した隔壁とを有する電解槽で、前記電解槽に食塩水等の電解液を満たし前記陰極と陽極に直流電圧を付加する電解水生成装置であり、水素イオン伝導型膜は水素イオンだけを通過させる性質をもつため、陽極では塩素ガスや酸素ガスを発生するとともに水の分解で水素イオンが生じ、陰極では水の分解で生じた水素イオンに電子が授与され水素ガスが発生することとなり、陽極と陰極の間で水素イオンの伝達が起こり、水素イオン伝導型膜の水素イオンだけの伝達する働きによりカソード室ではアルカリ金属の増加によりアルカリ性になることなくアノード室においても塩素イオンの増加で酸性となることなく比較的中性を保つこととなり、排水が容易で人体への影響も少ない強還元性の電解水と強酸化性の電解水を得ることができる。

【0017】請求項2に記載の発明は、陰極を持つカソード室を電解液で満たし、陽極を持つアノード室は浄水又はイオン交換水又は蒸溜水又は純水で満たし、陽極は貫通穴を有するメッシュ状に形成し、隔壁の水素イオン伝導型膜に密着させてなる電解槽を特徴とするもので、水素イオン伝導型膜に密着させることにより導電性を確保すると共に、水の分解で生じる水素イオンを水素イオン伝導型膜に陽極の貫通穴を通じて効率よく伝達するものであり、アノード室の浄水又はイオン交換水又は蒸溜水又は純水は強酸化性をもつと共に不純物の非常に少ない電解水となり、半導体等の洗浄に使用しても残分が残らず使用が可能となるものである。

【0018】請求項3に記載の発明は、カソード室及びアノード室を浄水又はイオン交換水又は蒸溜水又は純水で満たし、陰極と陽極は貫通穴を有するメッシュ状に形成し隔壁の水素イオン伝導型膜に密着させてなるもので、

両極とも水素イオン伝導型膜に密着させることにより導電性を確保し、陽極側の水の分解で生じる水素イオンを水素イオン伝導型膜に貫通穴を通じて効率よく伝達し、また陰極で生成する水素ガスを水素イオン伝導型膜と貫通穴を通じてカソード室内に生じせしめる様にしたもので、アノード室の浄水又はイオン交換水又は蒸溜水または純水は強酸化性をもつと共に、カソード室の浄水又はイオン交換水又は蒸溜水又は純水は強還元性を有する電解水を得るものであり、両室共に不純物の非常に少ない殺菌洗浄力を有する電解水となる。

【0019】請求項4記載の発明は、電解液で満たされ、陽極が浸漬してなるアノード室と、貫通穴を有するメッシュ状に形成した陰極との間に水素イオン伝導型膜を介在させ、前記陰極は前記水素イオン伝導型膜に密着し、前記陰極表面に酸素を含むガスを順次送り込む吸排気機構とを設けた電解槽で、前記陰極と陽極に直流電圧を付加する電解水生成装置であり、アノード室の電解液は中性の殺菌洗浄用電解水となるもので、陰極は吸排気機構と貫通穴により送り込まれる酸素と水素イオン伝導膜を開始アノード室より伝達される水素イオンと電子との反応で水の生成が起こるものであり、アノード室にできる電解水は中和された安全で排水において問題のない酸化水であり、陰極側では酸素を送り込むことにより水を生成させることができるので非常に構造的に簡素化ができるものである。

【0020】請求項5記載の発明は、電解液を食塩、クエン酸、ほう酸、酢酸等の導電性食品添加物の水溶液とすることで、厨房機器の洗浄殺菌に使用したとき食品に接触しても食品衛生安全に取扱いできるものとしたものである。

【0021】請求項6記載の発明は、浄水又はイオン交換水又は蒸溜水又は純水で満たされたアノード室に浸漬する陽極と陰極との間に水素イオン伝導型膜を介在させ、前記陽極と陰極は貫通穴を有するメッシュ状に形成され前記水素イオン伝導型膜に密着してなり、前記陰極表面に酸素を含むガスを順次送り込む吸排気機構とを設けた電解槽で、前記陰極と陽極に直流電圧を付加する電解水生成装置であり、水素イオン伝導型膜に密着させることにより導電性を確保し、水の分解で生じる水素イオンを水素イオン伝導型膜に陽極の貫通穴を通じて効率よく伝達するもので、アノード室の浄水又はイオン交換水又は蒸溜水又は純水は強酸化性をもつと共に不純物の非常に少ない電解水となり、半導体等の洗浄にも残分が残らず使用が可能となるものである。そしてさらに陰極側では酸素を送り込むことにより水を生成させ水素ガスの発生がなく安全で、且つ非常に構造的に簡素化ができるものである。

【0022】請求項7記載の発明は、電解槽のカソード室及び／又はアノード室に電解質又は浄水又はイオン交換水又は蒸溜水又は純水を順次送り込む注入機構と順次

排出する排出機構とを設け循環させたもので、循環水を利用することにより連続的に必要な電解水を確保できるようにしたものである。

【0023】以下本発明の一実施例の形態について、図面を参照しながら説明する。

（実施の形態1）図1は本発明の一実施の形態である電解水生成装置11の概要図と電解槽12部の横断面図を示すものである。

【0024】電解槽12は陽極13を持つアノード室14と陰極15を持つカソード室16とで構成されており、アノード室14とカソード室16は水素イオン伝導型膜17で形成する隔壁18で仕切られている。水素イオン伝導型膜17はスルホン酸基を有するテフロン系の樹脂が主体の膜であり、スルホン酸基の水素イオンが自由に入出入りする性質を利用して水素イオン伝導型膜17として開発されたものである。この水素イオン伝導型膜17は水素イオンのみを伝達する性質をもつ樹脂であり、その他のイオンを伝導したり、透過したりすることはない。今回使用した水素イオン伝導型膜17はデュボン社からナフィオン膜との名で販売されている高分子膜を用いた。

【0025】19は陽極13に正電位を、陰極15に負の電位を付加する直流電源であり、アノード室14の電解液A20に浸漬された酸化電位測定電極21の信号を酸化電位計22で計測し、またカソード室16の電解液B23に浸漬した還元電位測定電極24の信号を還元電位計25で計測し、稼働と停止を制御するものである。陽極13と陰極15の材質はチタンの板に白金をコーティングしたものを用いた。

【0026】26は食塩の濃度を所定の濃度に調整する電解源液調整装置A27と、フロートスイッチA28により自動的に開閉する開閉バルブA29とで構成する注入機構Aであり、調整電解源水である電解液20をアノード室14へ順次送り込むものである。

【0027】30はカソード室16に食塩の濃度を所定に調整した電解源水の電解液23を順次送り込む注入機構Bであり、電解源液調整装置B31とフロートスイッチB32により開閉する開閉バルブB33で構成される。

【0028】34はアノード室14の電解水を順次排出する排水機構Aであり、35はカソード室16の電解水を同様に順次排出する排水機構Bとなっている。

【0029】また36はアノード室14の電解により発生する酸素ガス又は塩素ガスの排出口Aであり、37はカソード室16の電解で発生する水素ガスを排出する排気口Bである。

【0030】以下、上記で説明した実施の形態1の電解水生成装置11の作用と電解槽12中の科学反応について説明する。

【0031】まず、電解源液調整装置A27を稼働し食



塩水の濃度を決める。今回は厨房機器の殺菌洗浄水を狙い、0.9%の生理食塩水並みの濃度に設定した。次に電解液A20を開閉バルブA29の開放によりアノード室14に注入する。開閉バルブA29はフロートスイッチA28が満水を検知するまで開放されており、アノード室14が電解液で満水になると自動的に閉鎖されることとなる。

【0032】カソード室16についても同様に電解液調整装置B31を稼働し、調整源液を0.9%の生理食塩水並みの濃度に設定した。次に電解液B23を開閉バルブB33の開放によりカソード室16に注入する。開閉バルブB33はフロートスイッチB28が満水を検知するまで開放されており、カソード室16が満水になると自動的に閉鎖されることとなる。

【0033】次に直流電源19の本体電源端子38を商用電源につなぎ電気分解の運転を開始する。今回、陽極13を正電位とし陰極15を負電位とし陽極13と陰極15との間に直流電圧3Vを付加した。

【0034】陽極13及び陰極15の表面材質は腐食電位の高い白金で形成されており、電極材の溶解は殆ど無く、陽極13の表面においては電解液20中の塩素イオンと水分子を酸化し、(化1)～(化4)の反応が見られ、陽極13表面から塩素ガスや酸素ガスを発生する。また、電解水中には殺菌力を持つ次亜塩素酸や次亜塩素イオンと水素イオンが生じる。

【0035】

【化1】



【0036】

【化2】



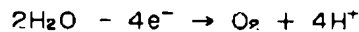
【0037】

【化3】



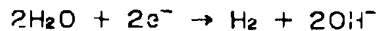
【0038】

【化4】



【0039】

【化5】



【0040】ここでは、水素イオンの対イオンである塩素イオンの増加はほとんどないため過剰となる水素イオンはイオン伝導型膜17を通じてカソード室16に移動する。そのため、アノード室14内では水素イオン濃度の増加は見られず強酸性水にはならない。

【0041】陰極15の表面においては(化5)の科学反応が起こり、水素ガスを発生すると共に電解液23中には水酸基イオンを生じる。この水酸基イオンはアノード室16で生成し、水素イオン伝導型膜17を通過してきた過剰の水素イオンと反応することにより水となり、

中和されるためカソード室の電解水23のアルカリ性への変化も緩和される。しかし水素ガスの発生過程における中間生成物として水素ラジカルなどの還元剤が生成されているため、殺菌力を有する電解水を得ることができる。

【0042】尚、酸化電位測定電極21と酸化電位計22により酸化電位を測定した結果が水素電極に大使1200mV以上で、還元電位測定電極24と還元電位計により還元電位を測定した結果が-900mV以下となれば、電解をストップするようにした。

【0043】以上のように水素イオン伝導型膜17を電解槽12の隔壁18として利用することにより、水素イオンの移動が起こるだけで、食塩水に含まれるナトリウムイオンや塩素イオンの移動が遮断されることにより、アノード室14の電解水が強酸性水になることがなく、またカソード室16の電解水が強アルカリ水になることもないので取扱いも容易で、排水についても中和処理も必要としない電解水を得ることができる。尚、この電解水は0.9%の生理的食塩水を使用しているため食塩の電気分解で生じる塩素、次亜塩素酸、次亜塩素酸イオンにより強力な殺菌効果を有するもので、また、カソード室16の電解水も水素ラジカルによる還元能をもつもので殺菌効果を有するものである。

【0044】(実施の形態2)図2は本発明の他の実施例の形態である電解水生成装置11の概要図と電解槽12部の横断面図を示すものである。尚、実施の形態1と同じ構成部分については説明を省略する。

【0045】電解槽12は実施の形態1同様にアノード室14とカソード室16とで構成されており、アノード室14とカソード室16とは水素イオン伝導型膜17で形成する隔壁18で仕切られている。陽極39は貫通穴を有する多孔性のメッシュ状のチタン材に白金をコーティングしたものをを用い、水素イオン伝導型膜17に密着して取り付けられている。陽極39材としてはパンチメタル等のチタン電極に白金をコーティングしたものが利用できる。

【0046】40は純水を創る純水製造装置41と、フロートスイッチA28により自動的に開閉する開閉バルブA29とで構成する注入機構Cであり、純水をアノード室14へ順次送り込むものである。

【0047】尚、カソード室16については実施の形態1と同様の構造となっている。次にかかる構成での電解水生成装置11の作用と電解槽12中の化学反応について説明するが、実施の形態1と同様部分は省略する。

【0048】今回は半導体製造工程のセラミックの表面を洗浄するのに使用される超純水の酸化力の向上を狙う電解水の製造であり、まず純水製造装置41を稼働する。次に純水である電解液A20を開閉バルブA29の開放によりアノード室14に注入する。開閉バルブA29はフロートスイッチA28が満水を検知するまで開放

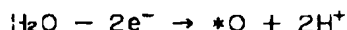
されており、アノード室14が電解液で満水になると自動的に閉鎖されることとなる。

【0049】次に、直流電源19の本体電源端子38を商用電源につなぎ電気分解の運転を開始する。今回、陽極39を正電位とし陰極15を負電位とし陽極39と陰極15との間に直流電圧3Vを付加した。

【0050】陽極39及び陰極15の表面材質は腐食電位の高い白金で形成されており、電極材の溶解は殆ど無く、陽極39の表面においては水分子を酸化し、(化6)～(化8)の反応が見られ、陽極39表面から酸素ガスが発生する。また、電解水中には水素イオンの他に、殺菌力を持つ酸素ラジカルや水酸基ラジカル、さらに過酸化水素やオゾンが生成する。

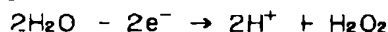
【0051】

【化6】



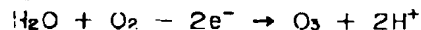
【0052】

【化7】



【0053】

【化8】



【0054】水素イオンの対イオンは元から存在しないため、過剰となる水素イオンはアノード室には存在できず、水素イオン伝導型膜17を通じてカソード室16に移動する。よってアノード室14内では水素イオン濃度の増加は見られず強酸性水にはならない。

【0055】尚、陽極39に貫通穴を有するメッシュ状の材料とし、水素イオン伝導膜17に密着させることにより、不導電体の純水でも電解水20と接する陽極39の表面で生成する水素イオンを円滑に水素イオン伝導型膜17に伝達することが可能となるものである。すなわち、陽極39と水素イオン伝導膜17とを隔離すると水素イオンの移動が不導電体の純水層に邪魔されて円滑に行かず、また貫通穴が無いと純水に接する面から水素イオン伝導膜17への水素イオンの移動を陽極39自身が遮断するため円滑な水素イオンの移動ができなくなる。

【0056】実施の形態1と同様に、陰極15の表面においては(化5)の化学反応が起こり、水素ガスを発生すると共に電解水23中には水酸基イオンを生じる。この水酸化基イオンはアノード室16で生成し、水素イオン伝導型膜17を通過してきた過剰の水素イオンと反応することにより水となり、中和されるためカソード室の電解水23のアルカリ性への変化も緩和される。しかし水素ガスの発生過程における中間生成物として水素ラジカルなどの還元剤が生成されているため、殺菌力を有する電解水を得ることができる。

【0057】以上のように陽極39として貫通穴を有する多孔性のメッシュ状のチタン材に白金をコーティングしたものをを用い、水素イオン伝導型膜17に密着して取

りつけることにより、不導電体である純水の電気分解で生成する水素イオンを円滑に陰極15に移動させ電気分解を可能とすることで、酸素の生成時に生じる酸素ラジカルやオゾンに酸化力を利用できる純水電解水を製造できる。また、この電解水が中性であることから人体への影響も少なく、排水における公害の問題が生じないものとなる。

【0058】(実施の形態3)図3は本発明の他の一実施の形態である電解水生成装置11の概要図と電解槽12部の横断面図を示すものである。尚、実施の形態1又は2と同じ構成部分については説明を省略する。

【0059】電解槽12は実施の形態1同様にアノード室14とカソード室16とで孔性されており、アノード室14とカソード室16とは水素イオン伝導型膜17で形成する隔壁18で仕切られている。陽極39と同様に陰極42も貫通穴を有する多孔性のメッシュ状のチタン材に白金をコーティングしたものをを用い、水素イオン伝導型膜17に密着して取り付けられている。

【0060】43は純水を創る純粋製造装置44と、フロートスイッチB32により自動的に開閉する開閉バルブB33とで構成する注入機構Dであり、純水をカソード室16へ順次送り込むものである。

【0061】次にかかる構成での電解水生成装置11の作用と電解槽12中の化学反応について説明するが、実施の形態1又は2と同様部分は省略する。

【0062】半導体製造工程のセラミックの表面を洗浄するのに使用される超純水の酸化力及び還元力の向上を狙う電解水の製造を目的とするものであり、まず純水製造装置44を稼働する。次に純水である電解液B23を開閉バルブB33の開放によりカソード室16に注入する。開閉バルブB33はフロートスイッチB32が満水を検知するまで開放されており、カソード室16が電解液で満水になると自動的に閉鎖されることとなる。

【0063】尚、アノード室14と注水機構C40については実施の形態2と同様の構造となっている。

【0064】次に、直流電源19の本体電源端子38を商用電源につなぎ電気分解の運転を開始する。陽極39を正電位とし陰極42を負電位とし陽極39と陰極42との間に直流電圧3Vを付加した。

【0065】陽極39及び陰極42の表面材質は腐食電位の高い白金で形成されており、電極材の溶解は殆ど無く、陽極39の表面においては実施の形態2と同様の反応が起こる。陰極42については(化5)の反応が陰極表面で起こり、水素イオンが水素ガスとなる反応の過程では中間生成物として還元性を有する水素ラジカルが生成し殺菌力を有する電解水となる。

【0066】尚、陰極42に貫通穴を有するメッシュ状の材料とし、水素イオン伝導型膜17に密着させることにより、純水である電解水23と接する陰極42の表面で生成する水酸基イオンと円滑に水素イオン伝導膜17

を通過してくる水素イオンと反応させることが可能となるものである。すなわち、陰極42と水素イオン伝導型膜17とを隔離すると水酸基イオン又は水素イオンの移動が不導電体の純水層に邪魔されて円滑に行かず、また貫通穴が無いと純水に接する面から水素イオン伝導型膜17への水酸基イオンの移動を陰極42自身が遮断するため円滑な水酸基イオンと水素イオンの移動ができなくなる。

【0067】実施の形態2と同様に、陽極39の表面においては(化6)～(8)の化学反応が起こり、酸素ガスを発生すると共に電解液20中に水素イオンを生じる。この水素イオンは水素イオン伝導型17を通過しカソード室16で生じた水酸基イオンと反応することにより水となり中和されるためカソード室16の電解液23のアルカリ性への変化は緩和される。しかし水素ガスの発生過程における中間生成物として水素ラジカルなどの還元剤が生成されているため、殺菌力を有する電解水を得ることができる。

【0068】以上のように陰極42として貫通穴を有する多孔性のメッシュ状のチタン材に白金をコーティングしたものをを用い、水素イオン伝導型膜17に密着して取り付けることにより、不導電体である純水の電気分解で生成する水酸基イオンとアノード室14から伝達される水素イオンとを円滑に中和させることができ、水の電気分解が可能となることで、アノード室14では酸素の生成時に生じる酸素ラジカルやオゾンや過酸化水素水の酸化力を持つ純水の電解水が製造でき、カソード室16では還元性を持つ純水の電解水が製造ができる。また、この電解水は中性であることから人体への影響も少なく、排水における公害の問題が生じないものとなる。

【0069】(実施の形態4)図4は本発明の他の一実施の形態である電解水生成装置11の概要図と電解層12部の横断面図を示すものである。尚、実施の形態1又は2又は3と同じ構成部分については説明を省略する。

【0070】電解槽12は実施の形態1同様にアノード室14とカソード室16とで構成されており、アノード室14とカソード室16とは水素イオン伝導型膜17で形成する隔壁18で仕切られている。陽極13はチタン板に白金をコーティングしたものを使用し、陰極42は貫通穴を有する多孔性のメッシュ状のものとして電極面での反応を大きくするために、表面に白金超微粒子を担持したカーボン粉末とフッ素樹脂粉末の混合物を加圧成形して適度な発水性を持たせた多孔質ガス拡散電極を用い、陰極は水素イオン伝導型膜17に密着して取り付けられている。

【0071】26は実施の形態1と同様の電解液調整装置A27とフロートスイッチA28により自動的に開閉する開閉バルブA29とで構成する注入機構Aであり、調整電解液である電解液20をアノード室14へ順次送り込むものである。

【0072】45は吸入口46に取りつけられたフィルター47を介して外気を吸入する吸入ファン48と、陰極表面にガスを均一に導入するバランスタクト49と排気口50とからなるカソード室16に酸素を含むガスを順次送り込む吸排気機構である。

【0073】次にかかるとの構成での電解水生成装置11の作用と電解槽12中の化学反応について説明するが、実施の形態1又は2又は3と同様部分は省略する。

【0074】まず、電解液調整装置A27を稼働し所定の食塩水濃度を定めるが、以下アノード室14側の作用と化学反応については実施の形態1と同様であり説明は省略する。この電解水の主要な用途は厨房および機器の殺菌洗浄水で野菜の蘇生水として、また食器やまな板の洗浄殺菌用である。

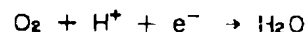
【0075】この実施の形態においては直流電源19の本体電源端子38を商用電源につなぎ電気分解の運転を開始するが、陽極13と陰極42との間に直流電圧3Vを付加し、直流電源19はアノード室14の酸化電位測定電極21と酸化電位計22により酸化電位を測定し、アノード室14の電解水の酸化電位が1200mV以上になった時、運転を停止するように制御されている。

【0076】陽極13では(化1)～(化4)の反応が起こり、塩素ガスと酸素ガスを生成すると共に殺菌力のある時亜塩素酸の次亜塩素酸イオンを生成し、また水素イオンを生成する。水素イオンの対イオンである塩素イオンは原理的に増加することは考えられないので過剰の水素イオンは水素イオン伝導型膜17を通過してカソード室16側に移動する。

【0077】カソード室16の陰極42表面では吸排気機構45により送り込まれてくる酸素と、直流電源19の負の電位として流れてくる電子と、水素イオン伝導型膜17をアノード室から通過してくる水素イオンとの3つの成分がぶつかり、(化9)の反応を起こすことにより水を生成する。生成した水は水素イオン伝導型膜17に吸着するか、蒸気となって排気口50から排出される。

【0078】

【化9】



【0079】又、電気分解によって発生した水素イオンが陰極42の表面で酸素ガスと反応して水分に変換する際、十分に反応が起こらず未反応の水素が残存する可能性を想定して陰極42の水素イオン伝導型膜17との逆面に白金触媒を担持したカーボン性ハニカム状集電体を圧着させるとよい。

【0080】尚、陰極42は貫通穴を有する多孔性のメッシュ状のものとして、表面に白金超微粒子を担持したカーボン粉末とフッ素樹脂粉末の混合物を加圧成形して適度な発水性を持たせた多孔質ガス拡散電極を用い、水素イオン伝導型膜17に密着して取り付けることによ

り、酸素を含むガスと、陰極42に運ばれた電子と、水素イオン伝導型膜17を通過してくる水素イオンとを円滑に反応させることが可能となるものである。すなわち、陰極42と水素イオン伝導型膜17とを隔離すると水素イオンの移動が不導電体のガス層に邪魔されて円滑に行かず、また貫通穴が無いとガスに接する面から水素イオン伝導膜17への酸素の移動を陰極42自身が遮断するため円滑な3つの成分の反応ができなくなる。

【0081】以上のように陰極42として多孔質ガス拡散電極のような貫通穴を有する多孔性メッシュ状のものを、水素イオン伝導型膜17に密着して取りつけることにより、吸排気機構45で送り込まれる酸素と、アノード室14から水素イオン伝導型膜17を通過してくる水素イオンと陰極に運ばれる電子により水分を生成することは、陰極42表面からの水素ガスの発生をなくすることになり、水素ガスによる火災や爆発の危険から逃れることができる。またカソード室16には電解液や浄水、イオン交換水、蒸留水、純水などの濃度管理や調整が必要でなくなるため、非常に電解槽の構造が簡素化でき、設備費用が削減できる。

【0082】また、当然アノード室14では酸素の生成時に生じる酸素ラジカルやオゾンや過酸化水素水の酸化力を利用できる純水の電解水が製造でき、この電解水は中性に近いことから人体への影響も少なく、排水における公害の問題が生じないものとなる。

【0083】(実施の形態5)図5は本発明の他の一実施の形態である電解水生成装置11の概要図と電解槽12部の横断面図を示すものである。尚、実施の形態1〜4と同じ構成部分については説明を省略する。

【0084】電解槽12は実施の形態1同様にアノード室14とカソード室16とで構成されており、アノード室14とカソード室16とは水素イオン伝導型膜17で形成する隔壁18で仕切られている。陽極39は貫通穴を有する多孔性のメッシュ状のチタン材に白金をコーティングしたものを、陰極42は貫通穴を有する多孔性のメッシュ状のものと、表面に白金超微粒子を担持したカーボン粉末とフッ素樹脂粉末の混合物を加圧成形して適度な発水性を持たせた多孔質ガス拡散電極を用い、また、両極とも水素イオン伝導型膜17に密着して取り付けられている。

【0085】アノード室14は実施の形態2と同様のものであり、カソード室16は実施の形態4と同様のもので、これら二つの形態を組み合わせたものである。

【0086】以上の組合せの形態であれば超純水の電気分解により生じる酸素ラジカル、過酸化水素水、オゾンの酸化性のある中性の殺菌洗浄材が製造可能となり、カソード室16には酸素を含むガスを送り込むだけで水溶液の濃度管理や調整が必要でなくなり、水素の発生がないことにより火災や爆発の危険も少ない電解水生成装置11を提供することができる。

【0087】また、又、当然アノード室14では酸素の生成時に生じる酸素ラジカルやオゾンや過酸化水素水の酸化力を利用できる純水の電解水が製造でき、この電解水は中性に近いことから人体への影響も少なく、排水における公害の問題が生じないものとなる。

【0088】また、本実施の形態事例で紹介した電解液は食塩水を主体に説明したが、電解により塩素ガスと酸素ガスを発生する電解液であれば同様の効果が得られるものである。しかし、厨房用の殺菌洗浄剤として使用するには食品の安全性面から考慮して食塩、クエン酸、ほう酸、酢酸等の導電性食品添加物の水溶液を電解液に使用することが望まれる。

【0089】また、図1で示すように電解槽12から順次電解液を排水できる排水機構A34および排水機構B35により、連続的に電解水を使用すると電解液20の推移が下がりフロートスイッチ28が働き、自動的に電解水供給装置27から新たな電解液20がそそがれることとなる。また、新たな電解液20の注入により酸化電位が下がると酸化電位計22が酸化電位の低下を示し、停止していた電解も自動的に再開されるようになる。このように、電解液、浄水、イオン交換水、蒸留水、純水を順次送り込む注入機構と順次排出する排出機構とで連続的に循環するようにすることにより効率良く電解水が生成される。

【0090】

【発明の効果】以上のように本発明の電解水生成装置は、陰極を持つカソード室と、陽極を持つアノード室と、前記カソード室とアノード室とを仕切る隔壁を水素イオン伝導型膜で構成したことを特徴とする電解槽で、前記電解槽に電解液または浄水、イオン交換水、蒸留水、純水を満たし、前記陰極と陽極に直流電圧を付加することによって電解液を処理する電解水生成装置で、中性に近い、酸化・還元性を有する殺菌および洗浄力の強い電解水を生成する特徴を持つ装置を提供することができる。

【図面の簡単な説明】

【図1】本発明の第1の実施の形態における電解水生成装置と電解槽の横断面図

【図2】本発明の第2の実施の形態における電解水生成装置と電解槽の横断面図

【図3】本発明の第3の実施の形態における電解水生成装置と電解槽の横断面図

【図4】本発明の第4の実施の形態における電解水生成装置と電解槽の横断面図

【図5】本発明の第5の実施の形態における電解水生成装置と電解槽の横断面図

【図6】従来の実施の形態における電解水生成装置の電解槽の横断面図

【符号の説明】

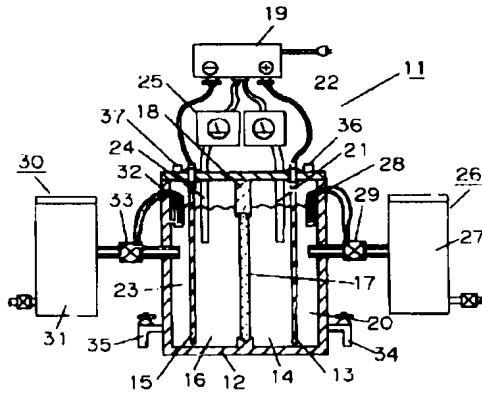
11 電解水生成装置

- 12 電解槽
- 13, 39 陽極
- 14 アノード室
- 15, 42 陰極
- 16 カソード室
- 17 水素イオン伝導型膜

- 18 隔壁
- 20, 23 電解液
- 26, 30, 40, 43 注入機構
- 33, 34 排水機構
- 45 吸排気機構

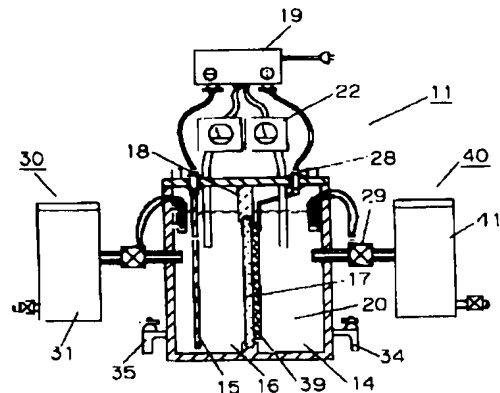
【図1】

- 11 電解水生成装置
- 12 電解槽
- 13 陽極
- 14 アノード室
- 15 陰極
- 16 カソード室
- 17 水素イオン伝導型膜
- 18 隔壁
- 26, 30 注入機構
- 34, 35 排水機構

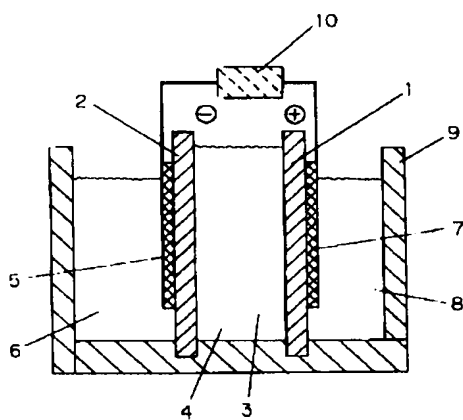


【図2】

- 11 電解水生成装置
- 12 電解槽
- 14 アノード室
- 15 陰極
- 16 カソード室
- 17 水素イオン伝導型膜
- 18 隔壁
- 30, 40 注入機構
- 34, 35 排水機構
- 39 陽極

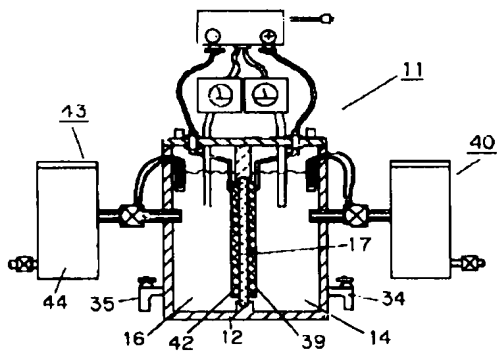


【図6】



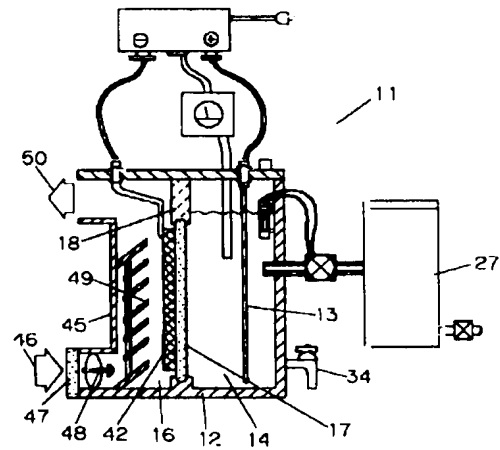
【図3】

- 11 電解水生成装置
- 12 電解槽
- 14 アノード室
- 16 カソード室
- 17 水素イオン伝導型膜
- 18 隔壁
- 31, 35 排水機構
- 39 陽極
- 10, 43 注入機構
- 42 陰極



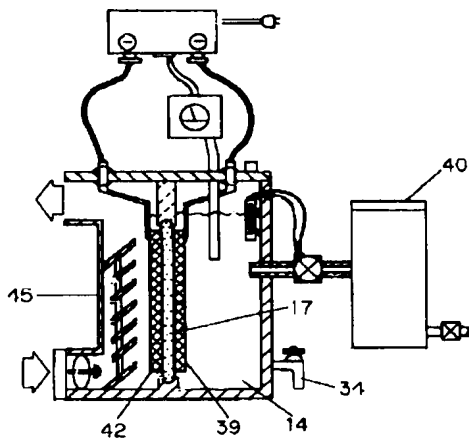
【図4】

- 11 電解水生成装置
- 12 電解槽
- 13 陽極
- 14 アノード室
- 16 カソード室
- 17 水素イオン伝導型膜
- 27 注入機構
- 34 排水機構
- 42 陰極
- 45 吸排気機構



【図5】

- 14 アノード室
- 17 水素イオン伝導型膜
- 34 排水機構
- 39 陽極
- 40 注入機構
- 42 陰極
- 45 吸排気機構



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**MEANS**

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**Request for Examination**Unrequested**The number of claims**7**Mode of Application**OL**Number of Pages**10(21)**Application number**Japanese Patent Application No. 8-118717(22)**Filing date**May 14, Heisei 8 (1996)(71)**Applicant****Identification Number**000004488**Name**MATSUSHITA REFRIGERATION CO.**Address**4-2-5, Takaida-hondori, Higashi-Osaka-shi, Osaka(71)**Applicant****Identification Number**000005821**Name**Matsushita Electric Industrial Co., Ltd.**Address**1006, Kadoma, Kadoma-shi, Osaka(72)**Inventor(s)****Name**Masatoshi Inatani**Address**4-2-5, Takaida-hondori, Higashi-Osaka-shi, Osaka Inside of MATSUSHITA REFRIGERATION CO.(72)**Inventor(s)****Name**\*\*\*\* Hisaaki**Address**1006, Kadoma, Kadoma-shi, Osaka Inside of Matsushita Electric Industrial Co., Ltd.(74)**Attorney****Patent Attorney****Name**Tomoyuki Takimoto (besides one person)

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**(57) Abstract**

**Technical problem** In consideration of the safety to a human body, and the environmental pollution at the time of abandonment, the sterilization which has oxidation / reduction nature near neutrality, and electrolytic water with a strong detergency are generated.

**Means for Solution** With the cell 12 constituting the septum 18 into which the cathode room 16 with the negative pole 15, the anode room 14 with the anode 13, and the cathode room 16 and the anode room 14 are divided from the hydrogen ion conduction type film 17. An electrolysis solution or water purification, ion exchange water, aqua destillata, and pure water are filled to the cell 12, direct current voltage is added to the negative pole 15 and the anode 13, and electrolytic water is processed.

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**Claim(s)**

**Claim 1**An electrolytic water producing device which fills an electrolysis solution with a cell which has the septum constituted from a hydrogen ion conduction type film which divides a cathode room with the negative pole, an anode room with the anode, and said cathode room and an anode room to said cell, and adds direct current voltage to said negative pole and the anode with it.

**Claim 2**The electrolytic water producing device according to claim 1 characterized by a cell which fills a cathode room with the negative pole with an electrolysis solution, fills an anode room with the anode with water purification, ion exchange water, aqua destillata, or pure water, and forms the anode in mesh state which has a through hole, and it makes it come to stick to a hydrogen ion conduction type film of a septum.

**Claim 3**The electrolytic water producing device according to claim 1 characterized by a cell which fills a cathode room and an anode room with water purification, ion exchange water, aqua destillata, or pure water, and forms the negative pole and the anode in mesh state which has a through hole, and it makes it come to stick to a hydrogen ion conduction type film of a septum.

**Claim 4**An electrolytic water producing device which adds direct current voltage to said negative pole and the anode with a pumping mechanism in which gas is sent in one by one, and a cell which provided \*\*, comprising:

An anode room which it is filled with an electrolysis solution and the anode immerses.

A hydrogen ion conduction type film is made to intervene between the negative poles formed in mesh state which has a through hole, said negative pole is stuck to said hydrogen ion conduction type film, and it is said cathode surface \*\*\*\*\*.

**Claim 5**The electrolytic water producing device according to claim 1, 2, or 4 which used an electrolysis solution as solution of conductive food additives, such as salt, citrate, way acid, and acetic acid.

**Claim 6**A hydrogen ion conduction type film is made to intervene between the anode and the negative pole which immerse in an anode room filled with water purification, ion exchange water, aqua destillata, or pure water, An electrolytic water producing device which is the cell which said anode and the negative pole were formed in mesh state which has a through hole, stuck them to said hydrogen ion conduction type film, and formed a pumping mechanism in which gas containing oxygen was sent in one by one in said cathode surface, and adds direct current voltage to said negative pole and the anode.

**Claim 7**From claim 1 to the electrolytic water producing device according to claim 6 characterized by comprising the following.

A potting machine style which sends an electrolysis solution, water purification, ion exchange water, or pure water into a cathode room and/or an anode room of a cell one by one.

A draining mechanism discharged one by one.

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**Detailed Description of the Invention****0001**

**Field of the Invention**This invention relates to the manufacturing installation of the treating solution for sterilization cleaning manufactured by electrolyzing water for the purpose of the sterilization cleaning of various pollutants, the surface treatment of industrial material, etc.

**0002**

**Description of the Prior Art**If it electrolyzes with the cell which has the anode room and cathode room which divided the salt solution in barrier membrane, while acid produced water is obtained, alkaline produced water will be obtained from the cathode room side from an anode room, as illustrated by JP,6-237747,A. Thus, the obtained produced water has high oxidation / reduction ability, and it is known that oxidation / reduction ability of this water has affected growth of washing of a medical device or a cooking appliance, the surface treatment of industrial material, disinfection sterilization of a microorganism, vegetation, etc.

**0003**The pollutant which is the target of washing or a surface treatment has lipid, such as protein



and body fluid, in a medical device, and there are penetrant removers, such as a soil bacillus of a perishable food, slime, such as a water scale, and fish and shellfishes, and also oil contamination in a kitchen. As an industrial material, the dirt of the ion-like substance of a semiconductor surface, a resultant, a liquid, and particulate matter serves as a subject.

**0004** Acid anode room side produced water has a bad strange prevention operation of tone **as opposed to / in a loan and alkaline cathode room side produced water / fish and shellfishes for a germicidal action** and an occurrence prevention operation of a drip, and a bad strange prevention operation of the tone of greenstuff. For this reason, each of these produced water is alone used as treating solutions, such as revival liquid for fresh vegetation, respectively.

**0005** What was called invasion by diffusion of adsorption by the ionic exchange seen in a glass surface etc., the adhesion by the electrostatic attraction of the ion seen on the surface of a semiconductor or metal and a semiconductor, metal, and the ion to the surface layer of ceramics is mentioned to the contamination gestalt of an ion-like substance. After such an ion-like substance carries out drugs washing, it is common to be washed by pure water or ultrapure water as finishing. For example, when washing a semiconductor, the ultrapure water of about 18 M omega/cm is used for electrical resistivity. And the method said that oxidative degradation of this pollutant is carried out, or it makes it dissolve is applied to removal of the pollutant of the fluid adhering to a silicon wafer etc., or the shape of a tunic.

As drugs used for oxidative degradation, what combined sulfuric acid and hydrogen peroxide, the thing which combined ammonium hydroxide and hydrogen peroxide, etc. are used in the oxidizing power of hydrogen peroxide.

**0006** Although use of the electrolytic water which electrolyzed and manufactured the salt solution to the process of the penetrant remover which adds these oxidizing power was also considered, in order to electrolyze smoothly in the conventional barrier membrane electrolysis, it was indispensable to have added electrolytes, such as salt, several percent. If an electrolytic ion will be considerably contained in the obtained electrolytic water for this reason and it is going to use for washing, for example, an electrolytic ion will remain and adhesion remains will be carried out on the surface of a washed object. And the problem of the kind by this remains ion occurs. For example, corrosion and degradation of a metallic material, \*\*\*\* of a perishable food, and when chlorides, such as salt, are further used for an electrolyte, the problem of nasty smells, such as an odor of chlorine, arises.

**0007** It faces across the intermediate room 4 between which it is placed by the electrolysis solutions 3, such as a salt solution divided with the cation form ion-exchange membrane 1 and anionic form ionic exchange type 2 like JP,7-75784,A shown by drawing 6 as a method of solving the above-mentioned problem, The thing of it being close to said cation form ion-exchange membrane 1 in the anode 7, coming to be close to the anion ion-exchange membrane 2 in the negative pole 5, carrying out the seal of approval of the direct current voltage to two electrodes by DC power supply 10, and performing electrolytic treatment with the cell 9 constituted from the cathode room 6 with the negative pole 5 and the anode room 8 with the anode 7 is devised.

**0008** Operation of the electrolytic treating device of the above-mentioned gazette is explained based on drawing 6. It is pure water poured out using a water purifying apparatus (not shown) as solution poured into the cathode room 6 and the anode room 8, and is placed between the intermediate rooms 4 by the salt solution as the electrolysis solution 3. If it electrolyzes by applying direct current voltage to the anode 7 and the negative pole 5, the chloride ion whose sodium ion which is a cation in the salt solution of the electrolysis solution 3 of the intermediate room 4 is anion ion at the negative pole 5 side can be drawn near to the anode 7 side. However, since it is placed between the anode 7 sides by the cation form ion-exchange membrane 1, movement of a chloride ion is intercepted and the hydrogen ion produced by the moisture solution of the anode room 8 moves it to the intermediate room 4 side from the anode room 8 side. Since it is placed between the negative pole 2 sides by the anionic form ion-exchange membrane 2, movement of sodium ion will be intercepted and hydroxyl group ion will move it to the intermediate room 4 from the cathode room 6 side. That is, water generates at the reaction of a hydrogen ion and hydroxyl group ion, and a salt solution is thinned with the intermediate room 4 with the generated water. When movement of such a hydrogen ion and hydroxyl group ion arises, current will flow between the negative pole 5 and the anode 7, the negative pole 5 to hydrogen gas will be

emitted by oxygen gas from the anode 7, and the electrolysis of water is performed.

**0009**In the oxygen generation reaction in this anode 7 surface, generation of the electrolytic water which will arise as an intermediate product and has an acid-bacteria cleaning effect is attained by oxidizing substances, such as an oxygen radical, hydrogen peroxide, and ozone.

**0010**

**Problem(s) to be Solved by the Invention**However, if it is the method of electrolyzing via the ion-exchange membrane of a cation form or an anionic form as mentioned above, using a salt solution as an electrolysis solution, In not adding direct current voltage, cation ion, such as sodium ion, flows into an anode room side under the influence of the osmotic pressure by density difference, Anion ion, such as a chloride ion, will flow into the cathode side, and the performance levels of the pure water filled at the cathode room or the anode room are reduced.

**0011**The separability of a cation form ion-exchange membrane is not perfect 100% during electrolysis operation, The ability of the present published market goods is about 90 to 95% of thing, and the chloride ion which is anion ion of several percent invades and turns on the anode room side which the sodium ion which is a cation of several percent invades into the negative pole side through an anionic form ion-exchange membrane, and has the anode.

**0012**Thus, a cathode room will show strong acid nature, and this chloride ion will change with the chloride ions which invaded as gaseous chlorine, if an electron is taken by the anode. Furthermore, although it changes as hypochlorous acid which dissolves gaseous chlorine in water and in which a bactericidal effect is shown, sodium ion and a salt will be formed for the offensive odor as an odor of chlorine with generating \*\*\*\*\*, and it will have an adverse effect to corrosion, electronic parts, etc. as a residue to a processed material.

**0013**They require cautions for handling in order to do damage to a human body when strong acid water and strong alkaline water become a cause which causes the stimulus to an opposite side human body, and destruction of the cell membrane by perviousness and long term use is carried out although some bactericidal effects are accepted.

**0014**Acid water and alkaline water became a cause of the pollution problem, and that a neutralization process is needed in wastewater etc. also had the time-consuming technical problem of waste water treatment.

**0015**

**Means for Solving the Problem**A thing with the feature which generates electrolytic water this invention is characterized by that comprises the following.

A cathode room with the negative pole.

An anode room with the anode.

With a cell constituting a septum into which said cathode room and an anode room are divided from a hydrogen ion conduction type film. Oxidation / reduction nature near **in an electrolytic water producing device which processes an electrolysis solution by filling an electrolysis solution or water purification, ion exchange water, aqua destillata, and purity to said cell, and adding direct current voltage to said negative pole and the anode** neutrality.

**0016**

**Embodiment of the Invention**The invention of this invention according to claim 1 is a cell which has the septum constituted from a hydrogen ion conduction type film which divides a cathode room with the negative pole, an anode room with the anode, and said cathode room and an anode room, Since it is an electrolytic water producing device which fills electrolysis solutions, such as a salt solution, to said cell, and adds direct current voltage to said negative pole and the anode and a hydrogen ion conduction type film has the character to pass only a hydrogen ion, While generating gaseous chlorine and oxygen gas in the anode, a hydrogen ion arises in disassembly of water, An electron will be awarded to the hydrogen ion produced by disassembly of water in the negative pole, and hydrogen gas will be emitted, Transfer of a hydrogen ion takes place between the anode and the negative pole, At an anode room, do not become acidity by the increase in a chloride ion by the work which only the hydrogen ion of a hydrogen ion conduction type film transmits, without becoming alkalinity by the increase in an alkaline metal in a cathode room, and neutrality will be maintained comparatively, Wastewater is easy and the influence on a human body can also obtain the electrolytic water of few strong reduction nature, and the electrolytic water of strong acid voltinism.

**0017**The invention according to claim 2 fills a cathode room with the negative pole with an electrolysis solution, and the anode room with the anode is filled with water purification, ion exchange water, aqua destillata, or pure water, It is what is characterized by the cell which forms the anode in the mesh state which has a through hole, and it makes it come to stick to the hydrogen ion conduction type film of a septum, Secure conductivity by making it stick to a hydrogen ion conduction type film, and. It is what transmits efficiently the hydrogen ion produced in disassembly of water through the through hole of the anode to a hydrogen ion conduction type film, Even if both the water purification, ion exchange water, aqua destillata, or pure water of an anode room turns into very little electrolytic water of an impurity suddenly and also uses strong acid voltinism for washing of a semiconductor etc., a retained material all becomes usable.

**0018**It is a thing which the invention according to claim 3 fills a cathode room and an anode room with water purification, ion exchange water, aqua destillata, or pure water, forms the negative pole and the anode in the mesh state which has a through hole, and it makes it come to stick to the hydrogen ion conduction type film of a septum, Conductivity is secured by sticking two poles on a hydrogen ion conduction type film, It is what produces and cheated out of the hydrogen gas which transmits efficiently the hydrogen ion produced in disassembly of the water by the side of the anode through a through hole to a hydrogen ion conduction type film, and is generated by the negative pole to the cathode interior of a room through the hydrogen ion conduction type film and the through hole, The electrolytic water in which water purification, the ion exchange water, aqua destillata, or pure water of an anode room also has strong acid voltinism, and both the water purification, ion exchange water, aqua destillata, or pure water of a cathode room has strong reduction nature suddenly is obtained, and it becomes electrolytic water in which both \*\* have very little sterilization cleaning power of an impurity.

**0019**The anode room which the invention according to claim 4 is filled with an electrolysis solution, and the anode immerses, It is the cell which made the hydrogen ion conduction type film intervene between the negative poles formed in the mesh state which has a through hole, stuck said negative pole to said hydrogen ion conduction type film, and formed the pumping mechanism in which the gas containing oxygen was sent in one by one in said cathode surface, It is an electrolytic water producing device which adds direct current voltage to said negative pole and the anode, and the electrolysis solution of an anode room is a thing used as the neutral electrolytic water for acid-bacteria washing, The negative pole is that to which generation of water takes place at the reaction of the hydrogen ion and electron to which a pumping mechanism, the oxygen sent in by a through hole, and a hydrogen ion conduction film are transmitted from a start anode room, The electrolytic water made into an anode room is neutralized oxidized water which is **in / it is safe and / wastewater** satisfactory, and in the negative pole side, since water can be made to generate by sending in oxygen, simplification is made very structurally.

**0020**The invention according to claim 5 is using an electrolysis solution as the solution of conductive food additives, such as salt, citrate, way acid, and acetic acid, and when it is used for the cleaning sterilization of a cooking appliance, even if it contacts foodstuffs, it shall deal with and be possible for food-sanitation-hygine-like safety.

**0021**The invention according to claim 6 makes a hydrogen ion conduction type film intervene between the anode and the negative pole which immerse in the anode room filled with water purification, ion exchange water, aqua destillata, or pure water, It is the cell which said anode and the negative pole were formed in the mesh state which has a through hole, stuck them to said hydrogen ion conduction type film, and formed the pumping mechanism in which the gas containing oxygen was sent in one by one in said cathode surface, Are an electrolytic water producing device which adds direct current voltage to said negative pole and the anode, and conductivity is secured by making it stick to a hydrogen ion conduction type film, It is what transmits efficiently the hydrogen ion produced in disassembly of water through the through hole of the anode to a hydrogen ion conduction type film, Both the water purification, ion exchange water, aqua destillata, or pure water of an anode room turns into very little electrolytic water of an impurity suddenly also in strong acid voltinism, and a retained material all also becomes washing of a semiconductor etc. usable. And further, in the negative pole side, by sending in oxygen, water is made to generate, there is no generating of hydrogen gas, and simplification is made very structurally safely.

**0022**The invention according to claim 7 is what forms and circulated the potting machine style

which sends an electrolyte, water purification, ion exchange water, aqua destillata, or pure water into the cathode room and/or anode room of a cell one by one, and the discharge mechanism discharged one by one, It enables it to secure required electrolytic water continuously by using circulating water.

**0023**The gestalt of one example of this invention is explained below, referring to drawings. (Embodiment 1) Drawing 1 shows the schematic diagram of the electrolytic water producing device 11 and the cross-sectional view of 12 copies of cells which are the 1 embodiments of this invention.

**0024**The cell 12 comprises the anode room 14 with the anode 13, and the cathode room 16 with the negative pole 15, and the anode room 14 and the cathode room 16 are divided with the septum 18 formed by the hydrogen ion conduction type film 17. Resin of a Teflon system which has a sulfonic group is a subject's film, and the hydrogen ion conduction type film 17 is developed as the hydrogen ion conduction type film 17 using the character in which the hydrogen ion of a sulfonic group goes in and out freely. This hydrogen ion conduction type film 17 is resin with the character to transmit only a hydrogen ion, and does not conduct or penetrate other ion. The hydrogen ion conduction type film 17 used this time used the poly membrane currently sold by the name with the Nafion film from the E. I. du Pont de Nemours person.

**0025**19 is DC power supply which add positive potential to the anode 13 and by which it adds electronegative potential to the negative pole 15, The signal of the reduction potential measuring electrode 24 which measured the signal of the oxidation potential measuring electrode 21 immersed in the electrolysis solution A20 of the anode room 14 with oxidation potential 22 **a total of** , and immersed in the electrolysis solution B23 of the cathode room 16 is measured with reduction potential 25 **a total of** , and operation and a stop are controlled. The construction material of the anode 13 and the negative pole 15 used what coated the board of titanium with platinum.

**0026**26 is the potting machine style A which constitutes the concentration of salt from the electrolysis \*\*\*\* adjusting device A27 adjusted to predetermined concentration, and the switching valve A29 automatically opened and closed with the float switch A28, and sends into the anode room 14 the electrolysis solution 20 which is adjustment electrolysis Gensui one by one.

**0027**30 is the potting machine style B which sends into the cathode room 16 the electrolysis solution 23 of electrolysis Gensui who adjusted the concentration of salt to predetermined one by one, and comprises the switching valve B33 opened and closed with the electrolysis \*\*\*\* adjusting device B31 and the float switch B32.

**0028**34 is the draining mechanism A which discharges the electrolytic water of the anode room 14 one by one, and 35 has become the draining mechanism B which discharges the electrolytic water of the cathode room 16 one by one in a similar manner.

**0029**36 is \*\*\*\*\*A of oxygen gas or gaseous chlorine emitted by electrolysis of the anode room 14, and 37 is the exhaust port B which discharges the hydrogen gas emitted in electrolysis of the cathode room 16.

**0030**Hereafter, the science reaction in an operation of the electrolytic water producing device 11 of Embodiment 1 explained by the above and the cell 12 is explained.

**0031**First, the electrolysis \*\*\*\* adjusting device A27 is worked, and the concentration of a salt solution is decided. The sterilization cleaning water of the cooking appliance was aimed at, and it was set as the concentration of 0.9% of physiological saline average this time. Next, the electrolysis solution A20 is poured into the anode room 14 by opening of the switching valve A29. The switching valve A29 is wide opened until the float switch A28 detects full of water, and when the anode room 14 is filled to the brim with water with an electrolysis solution, it will be closed down automatically.

**0032**The electrolysis \*\*\*\* adjusting device B31 was similarly worked about the cathode room 16, and adjustment \*\*\*\* was set as the concentration of 0.9% of physiological saline average. Next, the electrolysis solution B23 is poured into the cathode room 16 by opening of the switching valve B33. The switching valve B33 is wide opened until the float switch B28 detects full of water, and when the cathode room 14 is filled to the brim with water, it will be closed down automatically.

**0033**Next, the body power supply terminal 38 of DC power supply 19 is connected with commercial power, and operation of electrolysis is started. This time, the anode 13 was made into positive potential, the negative pole 15 was made into negative potential, and the direct current

voltage 3V was added between the anode 13 and the negative pole 15.

**0034**The quality of facing of the anode 13 and the negative pole 15 is formed with platinum with high corrosion potential, most dissolutions of an electrode material cannot be found, the chloride ion and water molecule in the electrolysis solution 20 are oxidized in the surface of the anode 13, the reaction of - (\*\* 1) (\*\* 4) is seen, and gaseous chlorine and oxygen gas are generated from the anode 13 surface. Hypochlorous acid, hypochlorite ion, and the hydrogen ion which have sterilizing properties in electrolytic water arise.

**0035**

**Formula 1**

**0036**

**Formula 2**

**0037**

**Formula 3**

**0038**

**Formula 4**

**0039**

**Formula 5**

**0040**Here, since there is almost no increase in the chloride ion which is a counter ion of a hydrogen ion, the hydrogen ion which becomes superfluous moves to the cathode room 16 through the ion conduction type film 17. Therefore, in the anode room 14, the increase in a hydrogen-ion density is not seen and does not become strong acid water.

**0041**The science reaction set on the surface of the negative pole 15 (\*\* 5) occurs, hydrogen gas is generated and hydroxyl group ion is produced in the electrolysis solution 23. This hydroxyl group ion is generated at the anode room 16, and since it becomes water and is neutralized by reacting to the superfluous hydrogen ion which has passed the hydrogen ion conduction type film 17, the change to alkalinity of the electrolytic water 23 of a cathode room is also eased. However, since reducing agents, such as a hydrogen radical, are generated as an intermediate product in the generating process of hydrogen gas, the electrolytic water which has sterilizing properties can be obtained.

**0042**Electrolysis was stopped when a result in which the oxidation potential measuring electrode 21 and a result of having measured oxidation potential oxidation potential by a total of 22 measured reduction potential with the reduction potential measuring electrode 24 and a reduction potential meter by not less than 1200 mV of ambassadors at a hydrogen electrode became less than -900mV.

**0043**Only by movement of a hydrogen ion taking place by using the hydrogen ion conduction type film 17 as the septum 18 of the cell 12 as mentioned above, Since electrolytic water of the anode room 14 does not turn into strong acid water and electrolytic water of the cathode room 16 does not turn into strong alkali water by intercepting movement of sodium ion and a chloride ion which are contained in a salt solution, handling is also easy, Electrolytic water which does not need neutralization processing about wastewater, either can be obtained. Since this electrolytic water is using 0.9% of physiological sodium chloride solution, it has a powerful bactericidal effect by chlorine, hypochlorous acid, and a hypochlorite which are produced in electrolysis of salt, and electrolytic water of the cathode room 16 also has the reduction ability according **and** to a hydrogen radical, and it has a bactericidal effect.

**0044**(Embodiment 2) Drawing 2 shows a schematic diagram of the electrolytic water producing device 11 and a cross-sectional view of 12 copies of cells which are the gestalten of other examples of this invention. Explanation is omitted about the same component part as Embodiment 1.

**0045**The cell 12 comprises the anode room 14 and the cathode room 16 like Embodiment 1, and the anode room 14 and the cathode room 16 are divided with the septum 18 formed by the hydrogen ion conduction type film 17. Using what coated with platinum a titanium material of porous mesh state which has a through hole, the anode 39 is stuck to the hydrogen ion conduction type film 17, and is attached. What coated titanium electrodes, such as a punching metal, with platinum as anode 39 material can be used.

**0046**40 is the potting machine style C constituted from the water purifying apparatus 41 which makes pure water, and the switching valve A29 automatically opened and closed with the float switch A28, and sends pure water into the anode room 14 one by one.

**0047**About the cathode room 16, it has the same structure as Embodiment 1. Next, although an operation of the electrolytic water producing device 11 in composition of starting and a chemical reaction in the cell 12 are explained, a portion is omitted like Embodiment 1.

**0048**It is manufacture of electrolytic water which aims at improvement in oxidizing power of ultrapure water used for washing the surface of ceramics of a semiconductor manufacturing process, and the pure manufacturing installation 41 is worked first this time. Next, the electrolysis solution A20 which is pure water is poured into the anode room 14 by opening of the switching valve A29. The switching valve A29 is wide opened until the float switch A28 detects full of water, and when the anode room 14 is filled to the brim with water with an electrolysis solution, it will be closed down automatically.

**0049**Next, the body power supply terminal 38 of DC power supply 19 is connected with commercial power, and operation of electrolysis is started. This time, the anode 39 was made into positive potential, the negative pole 15 was made into negative potential, and the direct current voltage 3V was added between the anode 39 and the negative pole 15.

**0050**The quality of facing of the anode 39 and the negative pole 15 is formed with platinum with high corrosion potential, most dissolutions of an electrode material cannot be found, a water molecule is oxidized in the surface of the anode 39, a reaction of - (\*\* 6) (\*\* 8) is seen, and oxygen gas is emitted from the anode 39 surface. In electrolytic water, an oxygen radical and a hydroxyl group radical with sterilizing properties other than a hydrogen ion and also hydrogen peroxide, and ozone generate.

**0051**

**Formula 6**

**0052**

**Formula 7**

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**0053**

**Formula 8**

**0054**Since a counter ion of a hydrogen ion does not exist from origin, the hydrogen ion which becomes superfluous cannot exist in an anode room, but moves to the cathode room 16 through the hydrogen ion conduction type film 17. Therefore, in the anode room 14, an increase in a hydrogen-ion density is not seen and does not become strong acid water.

**0055**It becomes possible to transmit smoothly a hydrogen ion which also generates pure water of a non-conductor on the surface of the anode 39 which touches the electrolytic water 20 to the hydrogen ion conduction type film 17 by considering it as material of mesh state which has a through hole in the anode 39, and making it stick to the hydrogen ion conduction film 17. Namely, if the anode 39 and the hydrogen ion conduction film 17 are isolated, it will be interfered with movement of a hydrogen ion by pure water layer of a non-conductor, and it will not go smoothly. If there is no through hole, in order that anode 39 self may intercept movement of a hydrogen ion on the hydrogen ion conduction film 17 from a field which touches pure water, movement of a smooth hydrogen ion becomes impossible.

**0056**A chemical reaction set on the surface of the negative pole 15 (\*\* 5) occurs like Embodiment 1, hydrogen gas is generated and hydroxyl group ion is produced in the electrolytic water 23. This

hydroxylation group ion is generated at the anode room 16, and since it becomes water and is neutralized by reacting to a superfluous hydrogen ion which has passed the hydrogen ion conduction type film 17, change to alkalinity of the electrolytic water 23 of a cathode room is also eased. However, since reducing agents, such as a hydrogen radical, are generated as an intermediate product in a generating process of hydrogen gas, electrolytic water which has sterilizing properties can be obtained.

**0057**By sticking to the hydrogen ion conduction type film 17, and attaching using what coated with platinum a titanium material of porous mesh state which has a through hole as the anode 39 as mentioned above, Pure water electrolytic water which can use oxidizing power for an oxygen radical produced in a generate time of oxygen or ozone by moving smoothly a hydrogen ion generated by electrolysis of pure water which is a non-conductor to the negative pole 15, and making electrolysis possible can be manufactured. Since this electrolytic water is neutral, there is also little influence on a human body and a problem of a public nuisance in wastewater does not produce it.

**0058**(Embodiment 3) Drawing 3 shows a schematic diagram of the electrolytic water producing device 11 and a cross-sectional view of 12 copies of cells which are other 1 embodiments of this invention. Explanation is omitted about Embodiment 1 or the same component part as 2.

**0059**Porosity of the cell 12 is carried out like Embodiment 1 in the anode room 14 and the cathode room 16, and the anode room 14 and the cathode room 16 are divided with the septum 18 formed by the hydrogen ion conduction type film 17. Using what coated with platinum a titanium material of porous mesh state which has a through hole, the negative pole 42 is also stuck to the hydrogen ion conduction type film 17, and is attached. **as well as the anode 39**

**0060**43 is the potting machine style D constituted from the pure manufacturing installation 44 which makes pure water, and the switching valve B33 automatically opened and closed with the float switch B32, and sends pure water into the cathode room 16 one by one.

**0061**Next, although an operation of the electrolytic water producing device 11 in composition of starting and a chemical reaction in the cell 12 are explained, a portion is omitted like Embodiment 1 or 2.

**0062**It aims at manufacture of electrolytic water which aims at improvement in oxidizing power of ultrapure water, and reducing power used for washing the surface of ceramics of a semiconductor manufacturing process, and the water purifying apparatus 44 is worked first. Next, the electrolysis solution B23 which is pure water is poured into the cathode room 16 by opening of the switching valve B33. The switching valve B33 is wide opened until the float switch B32 detects full of water, and when the cathode room 16 is filled to the brim with water with an electrolysis solution, it will be closed down automatically.

**0063**About the anode room 14 and the irrigation mechanism C40, it has the same structure as Embodiment 2.

**0064**Next, the body power supply terminal 38 of DC power supply 19 is connected with commercial power, and operation of electrolysis is started. The anode 39 was made into positive potential, the negative pole 42 was made into negative potential, and the direct current voltage 3V was added between the anode 39 and the negative pole 42.

**0065**The quality of facing of the anode 39 and the negative pole 42 is formed with platinum with high corrosion potential, most dissolutions of an electrode material cannot be found, and the same reaction as Embodiment 2 occurs in the surface of the anode 39. About the negative pole 42, a reaction of (\*\* 5) occurs in a cathode surface, and a hydrogen ion serves as electrolytic water which a hydrogen radical which has reduction nature as an intermediate product in process of a reaction used as hydrogen gas generates, and has sterilizing properties.

**0066**By considering it as material of mesh state which has a through hole in the negative pole 42, and making it stick to the hydrogen ion conduction type film 17, It becomes possible to make it react to hydroxyl group ion generated on the surface of the negative pole 42 which touches the electrolytic water 23 which is pure water, and a hydrogen ion which passes the hydrogen ion conduction film 17 smoothly. Namely, if the negative pole 42 and the hydrogen ion conduction type film 17 are isolated, it will be interfered with movement of hydroxyl group ion or a hydrogen ion by pure water layer of a non-conductor, and it will not go smoothly, If there is no through hole, in order that negative pole 42 self may intercept movement of hydroxyl group ion on the hydrogen ion conduction type film 17 from a field which touches pure water, movement of smooth hydroxyl

group ion and a hydrogen ion becomes impossible.

**0067** Like Embodiment 2, in the surface of the anode 39, a chemical reaction of - (\*\* 6) (8) occurs, oxygen gas is generated and a hydrogen ion is produced in the electrolysis solution 20. Since this hydrogen ion serves as water and is neutralized by reacting to hydroxyl group ion which passed the hydrogen ion conduction type 17 and was produced in the cathode room 16, change to alkalinity of the electrolysis solution 23 of the cathode room 16 is eased. However, since reducing agents, such as a hydrogen radical, are generated as an intermediate product in a generating process of hydrogen gas, electrolytic water which has sterilizing properties can be obtained.

**0068** By sticking to the hydrogen ion conduction type film 17, and attaching using what coated with platinum a titanium material of porous mesh state which has a through hole as the negative pole 42 as mentioned above, Because the electrolysis of water becomes can neutralize smoothly a hydrogen ion transmitted from hydroxyl group ion and the anode room 14 which are generated by electrolysis of pure water which is a non-conductor, and possible. At the anode room 14, electrolytic water of pure water with oxidizing power of an oxygen radical, ozone, and hydrogen peroxide solution which are produced in a generate time of oxygen can be manufactured, and manufacture can do electrolytic water of pure water with reduction nature in the cathode room 16. Since this electrolytic water is neutral, there is also little influence on a human body, and a problem of a public nuisance in wastewater does not produce it.

**0069** (Embodiment 4) Drawing 4 shows a schematic diagram of the electrolytic water producing device 11 and a cross-sectional view of 12 copies of electrolyzers which are other 1 embodiments of this invention. Explanation is omitted about the same component part as Embodiment 1, 2, or 3.

**0070** The cell 12 comprises the anode room 14 and the cathode room 16 like Embodiment 1, and the anode room 14 and the cathode room 16 are divided with the septum 18 formed by the hydrogen ion conduction type film 17. In order that the anode 13 may use what coated a titanium plate with platinum and the negative pole 42 may enlarge a reaction in an electrode surface as a thing of porous mesh state which has a through hole, Using a porous gas diffusion electrode which carried out pressing of the mixture of carbon powder and fluororesin powder which supported a platinum ultrafine particle on the surface, and gave water-repellent **moderate**, the negative pole is stuck to the hydrogen ion conduction type film 17, and is attached.

**0071** 26 is the potting machine style A constituted from the switching valve A29 automatically opened and closed with the same electrolysis \*\*\*\* adjusting device A27 and float switch A28 as Embodiment 1, and sends into the anode room 14 the electrolysis solution 20 which is adjustment electrolysis Gensui one by one.

**0072** 45 is a pumping mechanism in which gas containing oxygen is sent into the suction fan 48 which inhales the open air via the filter 47 attached to the admission port 46, and the cathode room 16 which consists of the balance duct 49 and the exhaust port 50 which introduce gas into a cathode surface uniformly one by one.

**0073** Although an operation of the electrolytic water producing device 11 in \*\*\*\*\* and a chemical reaction in the cell 12 are explained from the next, a portion is omitted like Embodiment 1, 2, or 3.

**0074** First, although the electrolysis \*\*\*\* adjusting device A27 is worked and predetermined salt solution concentration is decided, below, it is the same as that of an operation by the side of the anode room 14, a chemical reaction, therefore Embodiment 1, and explanation is omitted. Main uses of this electrolytic water are the objects for the cleaning sterilization of tableware or a cutting board as revival water of vegetables with a kitchen and sterilization cleaning water of apparatus.

**0075** Although the body power supply terminal 38 of DC power supply 19 is connected with commercial power in this embodiment and operation of electrolysis is started, The direct current voltage 3V is added between the anode 13 and the negative pole 42, and oxidation potential oxidation potential is measured by a total of 22 with the oxidation potential measuring electrode 21 of the anode room 14, and DC power supply 19 are controlled to suspend operation, when oxidation potential of electrolytic water of the anode room 14 is set to not less than 1200 mV.

**0076** In the anode 13, a reaction of - (\*\* 4) occurs (\*\* 1), when chlorine generates SU and oxygen gas and there are sterilizing properties, a hypochlorite of a chlorous acid is generated, and a hydrogen ion is generated. Since it is unthinkable that a chloride ion which is a counter ion of a hydrogen ion increases theoretically, a superfluous hydrogen ion passes the hydrogen ion



conduction type film 17, and moves to the cathode room 16 side.

**0077**Oxygen sent in by the pumping mechanism 45 on the negative pole 42 surface of the cathode room 16, Three ingredients of an electron which flows as electronegative potential of DC power supply 19, and a hydrogen ion which passes the hydrogen ion conduction type film 17 from an anode room collide, and water is generated by causing a reaction of (\*\* 9). Generated water sticks to the hydrogen ion conduction type film 17, or serves as a steam, and is discharged from the exhaust port 50.

**0078**

#### Formula 9

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**0079**When the hydrogen ion generated by electrolysis reacts to oxygen gas on the surface of the negative pole 42 and it changes into moisture, It is good to make the carbon nature honeycomb shape charge collector which supported the platinum catalyst supposing a possibility that a reaction does not fully occur but unreacted hydrogen remains, to the reverse side with the hydrogen ion conduction type film 17 of the negative pole 42 stick by pressure.

**0080**A porous gas diffusion electrode which the negative pole 42 carried out pressing of the mixture of carbon powder and fluororesin powder which supported a platinum ultrafine particle on the surface as a thing of porous mesh state which has a through hole, and gave water-repellent **moderate** is used, By sticking to the hydrogen ion conduction type film 17, and attaching, it becomes possible to make gas containing oxygen, an electron carried by the negative pole 42, and a hydrogen ion which passes the hydrogen ion conduction type film 17 react smoothly. Namely, if the negative pole 42 and the hydrogen ion conduction type film 17 are isolated, it will be interfered with movement of a hydrogen ion by gas reservoir of a non-conductor, and it will not go smoothly, If there is no through hole, in order that negative pole 42 self may intercept movement of oxygen on the hydrogen ion conduction film 17 from a field which touches gas, a reaction of three smooth ingredients becomes impossible.

**0081**By sticking to the hydrogen ion conduction type film 17, and attaching using a thing of porous mesh state which has a through hole like **as the negative pole 42** a porous gas diffusion electrode as mentioned above, Generating moisture with oxygen sent in by the pumping mechanism 45, a hydrogen ion which passes the hydrogen ion conduction type film 17 from the quality 14 of an anode, and an electron carried by the negative pole, Generating of hydrogen gas from the negative pole 42 surface will be lost, and a fire by hydrogen gas and danger of explosion can be escaped. Since it is **an electrolysis solution, water purification and ion exchange water, aqua destillata, pure water, etc.** it less necessary concentration control and adjusting for the quality 16 of a cathode, structure of a cell can be simplified dramatically and equipment cost can be reduced.

**0082**Naturally, electrolytic water of pure water which can use oxidizing power of an oxygen radical, ozone, and hydrogen peroxide solution which are produced in a generate time of oxygen can be manufactured, this electrolytic water also has little influence on a human body, and a problem of a public nuisance in wastewater does not produce it from it being close to neutrality at the anode room 14, either.

**0083**(Embodiment 5) Drawing 5 shows a schematic diagram of the electrolytic water producing device 11 and a cross-sectional view of 12 copies of cells which are other 1 embodiments of this invention. Explanation is omitted about the same component part as Embodiments 1-4.

**0084**The cell 12 comprises the anode room 14 and the cathode room 16 like Embodiment 1, and the anode room 14 and the cathode room 16 are divided with the septum 18 formed by the hydrogen ion conduction type film 17. The anode 39 the negative pole 42 as a thing of porous mesh state which has a through hole using what coated with platinum a titanium material of porous mesh state which has a through hole, Using a porous gas diffusion electrode which carried out pressing of the mixture of carbon powder and fluororesin powder which supported a platinum ultrafine particle, and gave water-repellent **moderate** , two poles are stuck to the hydrogen ion conduction type film 17, and are attached to the surface.

**0085**The anode room 14 is the same as that of Embodiment 2, that of the cathode room 16 is the same as that of 4 of an embodiment, and combines these two gestalten.

**0086**An oxygen radical which will be produced by electrolysis of ultrapure water if it is a gestalt of

the above combination, When manufacture becomes possible, it has **hydrogen peroxide solution and neutral sterilization cleaning material with the oxidizing quality of ozone** less necessary concentration control and adjustment of solution only by sending into the cathode room 16 gas containing oxygen and they do not have generating of hydrogen, the electrolytic water producing device 11 also with little a fire and danger of explosion can be provided.

**0087**Naturally, electrolytic water of pure water which can use oxidizing power of an oxygen radical, ozone, and hydrogen peroxide solution which are produced in a generate time of oxygen can be manufactured, and since this electrolytic water is close to neutrality, there is also little influence on a human body, and a problem of a public nuisance in wastewater does not produce it at the anode room 14.

**0088**Although an electrolysis solution introduced with this embodiment example explained a salt solution to a subject, same effect will be acquired if it is an electrolysis solution which generates gaseous chlorine and oxygen gas by electrolysis. However, using it as a sterilization cleaning agent for kitchens is expected to take into consideration from a safety viewpoint of foodstuffs, and to use solution of conductive food additives, such as salt, citrate, way acid, and acetic acid, for an electrolysis solution.

**0089**As drawing 1 shows, according to the draining mechanism A34 and the draining mechanism B35 which can drain an electrolysis solution one by one from the cell 12, if electrolytic water is used continuously, transition of the electrolysis solution 20 will fall, the float switch 28 will work, and the new electrolysis solution 20 will be automatically poured out from the electrolytic water feeder 27. If oxidation potential falls by pouring of the new electrolysis solution 20, a fall of oxidation potential a total of 22 oxidation potential will be shown, and stopped electrolysis will also come to be resumed automatically. Thus, electrolytic water is efficiently generated by making it circulate through an electrolysis solution, water purification, ion exchange water, distilled water, and pure water continuously by potting machine style sent in one by one and a discharge mechanism discharged one by one.

#### **0090**

**Effect of the Invention**It is a cell characterized by the electrolytic water producing device of this invention constituting the septum into which a cathode room with the negative pole, an anode room with the anode, and said cathode room and an anode room are divided from a hydrogen ion conduction type film as mentioned above, With the electrolytic water producing device which processes an electrolysis solution by filling an electrolysis solution or water purification, ion exchange water, aqua destillata, and pure water to said cell, and adding direct current voltage to said negative pole and the anode. A device with the feature which generates the sterilization which has oxidation / reduction nature near neutrality, and electrolytic water with a strong detergency can be provided.

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#### **Brief Description of the Drawings**

**Drawing 1**The cross-sectional view of the electrolytic water producing device in a 1st embodiment of this invention, and a cell

**Drawing 2**The cross-sectional view of the electrolytic water producing device in a 2nd embodiment of this invention, and a cell

**Drawing 3**The cross-sectional view of the electrolytic water producing device in a 3rd embodiment of this invention, and a cell

**Drawing 4**The cross-sectional view of the electrolytic water producing device in a 4th embodiment of this invention, and a cell

**Drawing 5**The cross-sectional view of the electrolytic water producing device in a 5th embodiment of this invention, and a cell

**Drawing 6**The cross-sectional view of the cell of the electrolytic water producing device in the conventional embodiment

#### **Description of Notations**

11 Electrolytic water producing device

12 Cell

13 and 39 Anode

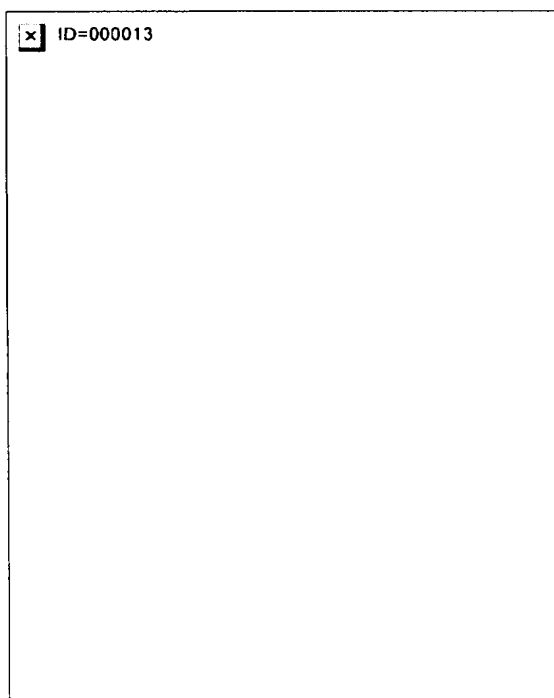
14 Anode room  
15 and 42 Negative pole  
16 Cathode room  
17 Hydrogen ion conduction type film  
18 Septum  
20 and 23 Electrolysis solution  
26, 30, 40, and 43 Potting machine style  
33 and 34 Draining mechanism  
45 Pumping mechanism

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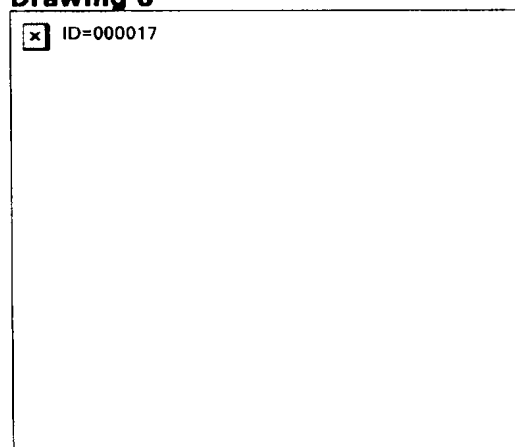
**Drawing 1**



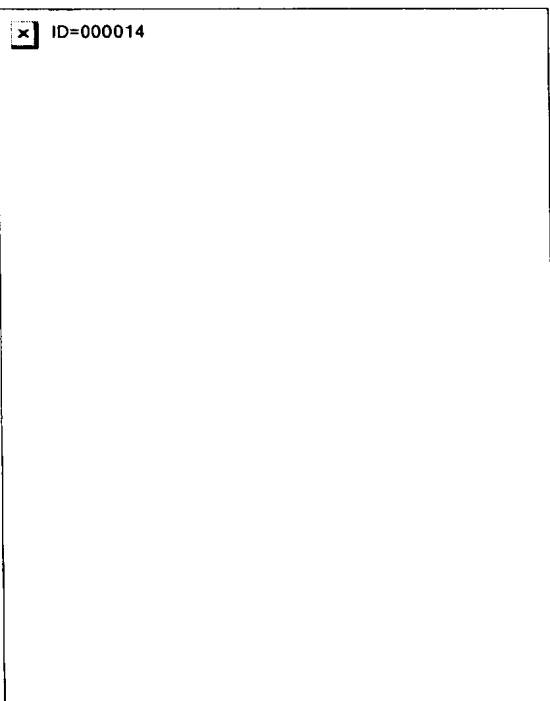
**Drawing 2**



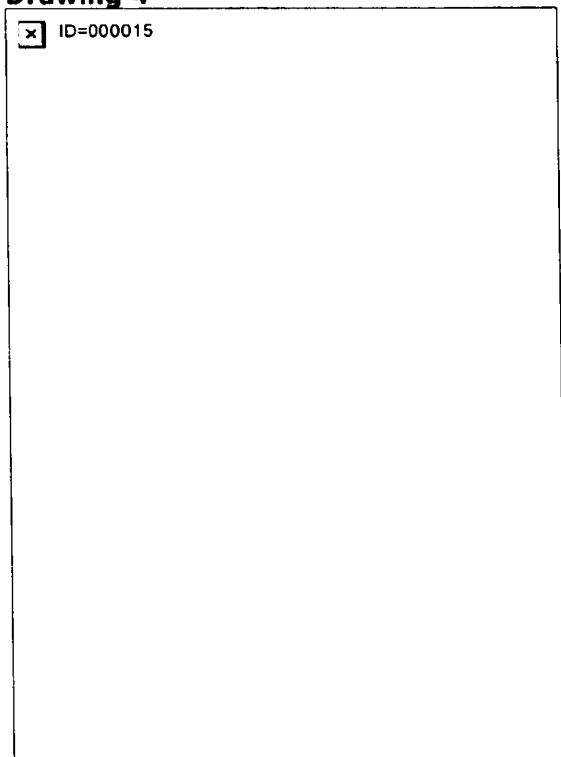
**Drawing 6**



**Drawing 3**



**Drawing 4**



**Drawing 5**

